A Tool Mark Identification Involving Rescue Equipment Used in a Series of Burglaries

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ABSTRACT

A case study is presented involving heavy rescue equipment used to breach a number of Automatic Teller Machines (ATMs). A large quantity of cash was stolen during this spree of burglaries in Victoria, Australia, between late 2018 and early 2019. The type of tool mark evidence collected in this case is novel in the author's experience, but the foundational principles of tool mark examination and identification allowed a tool to be identified, helping to implicate the suspects.

Introduction

Between the 17th of October, 2018 and the 3rd of March, 2019 a series of thefts and attempted thefts from Automatic Teller Machines (ATMs) and other safes occurred across ten different locations in western Victoria, Australia. The thefts occurred overnight at vulnerable or isolated sporting clubs or ATM sites. The offenders gained access to the premises housing the ATMs by cutting holes in the exterior wall and attempting to breach the ATMs at those locations. On one occasion, they tried to use a stolen front-end loader to breach the premises to remove the ATM. The safes and ATMs were breached with a range of tools including angle grinders, pry bars, bolsters, a hydraulic spreader, and cutter, all of which were recovered through the progression of the investigation. Of the ten attempts to breach or remove ATMs at the various locations, the offenders successfully breached one safe and two ATMs with a total of AUD \$283,000 (US \$206,000) being stolen. Examination of the damage to some of the ATMs revealed tool marks from multiple teeth of the tool or tools used to gain entry. There were individual characteristics present in the tool marks which could be identified to each other. The tool marks were thought to have been caused by the jaws of a hydraulic spreader. In this article, the tool mark evidence and how it was identified to such an uncommonly encountered tool will be explained. For any tool mark examiner, this would be considered an extremely unconventional case.

Examinations

The breached ATMs were removed from their installed locations and conveyed to a storage facility in metropolitan

Date Received: March 03, 2022 Primary Review Completed: May 23, 2022 Secondary Review Completed: June 27, 2022 Melbourne. Members of the Victoria Police Major Crime Scene Unit responded and examined the breached ATMs and recorded the damage (**Figures 1, 2, and 3**). Examiners collected a series of silicon casts of the numerous impressed and striated tool marks present on both the damaged bodies and doors. The casts were taken using grey 'Forensic-Sil.' The compound was applied into the tool marks using the pressureapplicator and spread onto the marked surfaces, with minimal air bubbles being captured in the casts.

Multiple casts from four of the damaged ATMs were submitted to the Victoria Police Ballistics Unit for examination and comparison. In all Australian States and Territories (except for South Australia), members of the Ballistics Unit conduct tool mark examinations and comparisons, this being a logical extension of forensic firearms casework.

The casts showed a range of impressed and striated tool marks with varying depths, widths and angles of attack. Notably, on the two ATMs that had been successfully breached, the casts showed a number of combination tool marks (impressed and striated) which featured multi-toothed impressions with up to seven individual teeth approximately three millimetres (0.118") apart (**Figure 4**). Other markings showed the width of the teeth as approximately 36 millimetres. (1.417"). Fine striated individual characteristics were observed in each tooth impression cast, with striae running perpendicular along the impression. These individual striae were formed from movement of the teeth as they impressed into the metal (**Figure 5**).

During the course of the inquiry, investigators submitted a collection of tools that were recovered from a stolen vehicle utilised by some suspects. These included assorted hand tools, multiple wrecking bars and a brick bolster chisel (a wide bladed tool used to crack masonry). Upon examination it was



Figure 1: One of the breached ATMs with tool marks indicated by white scale labels



Figure 2: An example of some of the striated tool marks with scale



Figure 3: Overlapping multi-toothed tool marks observed on a breached ATM with scale



Figure 4: A Forensic-Sil cast of multi-toothed impressed tool marks taken from one of the ATMs



Figure 5: Comparing casts of two exhibit tool marks to each other from the same ATM, with striated information visible in the marks running perpendicular to the impression

observed that the tips of the wrecking bars had been recently machined, in an apparent attempt to alter the working surfaces of the tools and obliterate marks that could be used for tool mark comparison (**Figure 6**).



Figure 6: The tip of one of the wrecking bars examined. Recent machining marks are observed on the tips in an apparent attempt to obscure or obliterate tool marks left by the tool

Submitted with the tools was a Genesis Rescue Systems manufactured, EFORCE 17C "BRUTE" model industrial spreader and cutter (**Figure 7**). The EFORCE 17C is a device that serves as heavy rescue equipment.



Figure 7: The exhibit EFORCE 17C "BRUTE" model industrial device

The EFORCE device is intended for use to assist with rescue from vehicle crashes or other such emergencies, where the jaws can be inserted between surfaces to widen a separation. The tool jaws can open out and apply substantial local force to crushed metal, allowing passage and freedom to trapped occupants, hence why this type of tool is often referred to generically as the "Jaws of Life". Alternatively, the jaws can close on and cut hard materials and surfaces, making the tool akin to a powerful, albeit very large, set of pliers.

The EFORCE device was powered by 24v Milwaukee brand batteries, some of which were seized from a suspect's house. At the time of the investigation, these batteries were not particularly common in Australia and a charger for the batteries was supplied by a local tool shop so that the seized batteries could be charged to allow testing. The device is activated by a power button at the rear of the grip and by a toggle switch on the underside of the grip that is pushed left to open or right to close the jaws. With no battery fitted, the device weighs 20.6 kilograms (45.42 pounds) and has an overall length of 94.5 centimetres (37.2"), with the jaws in the closed position. A hand grip is fitted at the middle of the device body to assist the operator in handling the device to position the jaws.

Examination of the EFORCE device spreader head showed that the metal of the tips of the jaws featured stepped teeth along the outer sides (**Figure 8**). Closest to the jaw tips there were seven teeth, each approximately 3 millimetres (0.118") apart (**Figure 9**). The width of the jaw in the area where the teeth were present measured 37 millimetres (1.46") in width. The tool jaws exhibited class characteristics consistent with the tool or tools used to create the marks seen in the casts from the breached ATMs.

The jaws of the device exhibited a number of different machining marks formed during manufacture. Notably, longitudinal tool marks were observed running horizontally or parallel along each of the stepped teeth suggesting that they may have been machined with a 'V' shaped broach or similar shaped cutter. Rounded overlapping facing marks were observed further back on the jaws where the teeth were larger.

Striae seen amongst the combination tool marks ran perpendicular to each of the teeth, so in considering the longitudinal tool marks discussed above, the possibility of subclass features existing from the machining of the teeth of the jaws causing the perpendicular striated marks was considered but was able to be eliminated.

There were multiple areas of damage and wear observed on the teeth, and the jaws had clearly seen a lot of use. The profile or peaks of the teeth had worn, with the teeth closer to the jaw tips being more worn and rounded than the rear three teeth that appeared to have seen less use and suffered less accumulated wear. A cast was taken of the teeth and examined, where it was observed that the damage and wear featured differently between the individual teeth (Figure 10).

Inquiries were made regarding sourcing another similar tool to compare the jaw features; however, another tool of the



Figure 8: The jaw tips of the exhibit EFORCE device



Figure 9: The teeth closest to the jaw tip with their spacing at approximately 3mm apart. The tips closer to the front of the jaws show more random wear than those further back



Figure 10: A Forensic-Sil cast taken from the teeth near the front of the right jaw, with random accidental damage observed across multiple teeth

same type was unable to be located for examination.

A second spreader head was received amongst the range of tools submitted for analysis (Figure 11).

The second spreader head width measured 70 millimetres (2.756") and it presented four stepped teeth on each jaw, with a tooth length of 10 millimetres (0.394"). The jaw tips each held three offset blocks each measuring 10 millimetres

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(0.394") that interlocked to the front when the jaws were closed. When the jaws were opened, a pointed metal ram was produced with a single blade edge measuring the width of the second spreader head. The class characteristics of the second spreader head were vastly different from those observed as impressed into the ATMs and as a result it was eliminated as a possible source of the tool marks (Figure 12).



Figure 11: The detached exhibit spreader head that was eliminated through differing class characteristics



Figure 12: The jaw tips of the exhibit spreader head that were eliminated through differing class characteristics

Through consultation with the investigators and the bank whose ATMs had been targeted, a decommissioned ATM body was installed at the Victoria Police Forensic Services Centre (VPFSC) to assist with capturing test tool marks in a similar material. Test tool marks were made in the door and body of this ATM using the EFORCE device as a spreader (Figure 13). These test tool marks were then cast with Forensic Sil for



Figure 13: The author making test impressions with the EFORCE device in an ATM provided and installed at the VPFSC to assist with testing. Both the tool and the substrate used for tests are not commonly encountered

comparison purposes.

Comparison of test to test tool mark casts showed that fine striated individual characteristics were produced within the impressed marks, and ran perpendicular to the width of the front tooth. Notably, these fine striated individual characteristics appeared across multiple teeth where partial impressions of the tooth edges were observed, with different striated markings visible on each tooth (Figure 14). The appearance of the test tool mark casts was consistent with the appearance of the tool marks in the exhibit cast, which also exhibited combination impressed/striated tool marks from the biting and movement of the teeth when contacting the metal. Some variation was noted between the tests and exhibit tool marks which was determined to be caused by the angle of attack, positioning of the spreader, or movement of the thick powder coating on the ATM body causing slippage during the application of the spreader.



Figure 14: A cast of a test tool mark produced by the EFORCE device when used as a spreader on the test ATM. Individual striae are present amongst the combination tool marks across the edges of multiple teeth

Comparison of the test tool mark casts to the casts from the ATM confirmed that the EFORCE device was the tool that was used to successfully breach some of the ATMs. Not only was there sufficient agreement of individual characteristics along the impression of the front tooth from the spreader but striated tool marks produced by several teeth along the jaw were also in excellent agreement (**Figures 15 and 16**).

Investigation, Prosecution and Conviction

During the first burglary, the offenders breached the safe at a sporting club using an angle grinder and pry bars which were removed from a tool shed at the targeted premises. AUD \$32,000 (US \$23,300) in cash was stolen and investigators identified that cash from this theft was used by the accused to purchase the EFORCE device from Industry Surplus Australia, based in Perth, Western Australia. This company is an online reseller of surplus goods from the mining, medical, and military industries, stocking both new and used goods.

The investigation was prolonged and the evidence included various CCTV recordings, tracking of vehicle movements, electronic surveillance of suspects, identification of distinct clothing worn by the offenders through CCTV images, photographs recorded on one suspect's personal Facebook page, as well as the tool mark evidence described. This was ultimately sufficient to result in the arrest of three men. Ammunition, twenty-two firearms, firearm components, explosives, counterfeit currency, fireworks, and a cultivated cannabis crop were also located in the possession of the suspects. All three accused pled guilty prior to proceeding to trial with various custodial sentences applied depending on each individual's level of involvement in the offenses.

Conclusion

Through identification of impressed and striated tool marks, the EFORCE device was identified as the tool that had been used to breach ATMs from which large amounts of cash were stolen. The identification of the EFORCE device as the tool used to breach these ATMs strengthened the prosecution case and worked along-side other forensic evidence in the case including:

- The identification of the accused's fingerprints on vehicles involved in the offending,
- Chemical trace evidence involving the analysis of paint samples from the ATMs and paint chips recovered on the jaws of the EFORCE device,
- The accused's DNA which was recovered on the EFORCE device,

- Shoe impression evidence linking the accused's shoes to impressions left at the site relating to the theft of the frontend loader used in one unsuccessful burglary.

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Figure 15: A comparison between test combination tool mark casts and exhibit casts taken from an ATM, with agreement seen between random striae from one of the teeth formed as part of the combination impressed and striated tool marks on both casts



Figure 16: Another comparison between test combination tool mark cast and exhibit cast taken from an ATM, with agreement seen with the individual striae on the subsequent tooth on both casts